International Journal of Innovative Research and Scientific Studies, 8(4) 2025, pages: 336-344

IJIRSS
International Journal of Innovative Research & Scientific Studies

ISSN: 2617-6548

URL: www.ijirss.com

The power of co-creation: Strengthening social forestry through the adopt-a-tree approach in Nagari Sirukam

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Abstract

Social forestry programs play a crucial role in sustainable forest management and community empowerment. However, their success depends on the institutional capacity of local forest management organizations. This study identifies key challenges faced by the Nagari Forest Management Institute (LPHN) in Sirukam, including limited management capacity, low stakeholder participation, weak multi-party collaboration, and the absence of a foster tree database. To address these issues, this research develops a co-creation-based social forestry model that is valid, practical, and effective. Using a Research and Development (R&D) approach, this study integrates the ADDIE model with Participatory Action Research (PAR) to ensure stakeholder engagement. Data collection involves questionnaires, interviews, observations, FGDs, and tests, analyzed through qualitative and quantitative methods. The model undergoes validity testing by experts, practicality testing by LPHN, and effectiveness evaluation through capacity-building outcomes. The study results in three key outputs: a co-creation-based social forestry development model book, the LPHN Sirukam pocketbook, and an application-based foster tree database. Findings indicate that the proposed model significantly enhances LPHN's capacity, strengthens stakeholder collaboration, and introduces technology-driven governance in community forestry. The research confirms that co-creation fosters sustainable forest management by promoting inclusivity and structured interventions. Beyond Nagari Sirukam, the findings offer a replicable framework for global community forestry programs, contributing to climate resilience, biodiversity conservation, and rural economic sustainability.

Keywords: Adopt-a-tree model, Co-creation approach, Forest management, Nagari Sirukam Forest, Social forestry.

DOI: 10.53894/ijirss.v8i4.7785
Funding: This study received no specific financial support.
History: Received: 23 April 2025 / **Revised:** 26 May 2025 / **Accepted:** 28 May 2025 / **Published:** 12 June 2025

Competing Interests: The authors declare that they have no competing interests.
Authors' Contributions: All authors contributed equally to the conception and design of the study. All authors have read and agreed to the published version of the manuscript.
Transparency: The authors confirm that the manuscript is an honest, accurate, and transparent account of the study; that no vital features of the study have been omitted; and that any discrepancies from the study as planned have been explained. This study followed all ethical practices during writing.
Publisher: Innovative Research Publishing

1. Introduction

Forest management in Indonesia is a multifaceted issue that involves various complications, prominently characterized by ineffective governance and the inadequacy of designated management units in numerous forest areas. Weak governance can impede effective management practices [1]. Additionally, the absence of appropriate management frameworks remains a critical concern that contributes to challenges in forest stewardship [2]. Over the years, Indonesia has experienced declining forest productivity, further exacerbated by socio-economic pressures that do not align with the interests of diverse stakeholders [2]. One significant challenge to enhancing these complications is the restricted land access for local communities, which has severe implications for increasing deforestation rates. Studies have indicated that difficulties surrounding land tenure and access play a pivotal role in forest depletion trends, coupled with insufficient governmental policies to alleviate these issues [3, 4].

Social forestry, as defined by Indonesia's Minister of Environment and Forestry Regulation No. 83/2016, is a sustainable forest management system carried out in state forests or customary/adat forests by local communities as primary stakeholders. The program includes Village Forest, Community Forest, People's Plantation Forest, Private Forest, Customary Forest, and Forestry Partnerships. The government has targeted 12.7 million hectares for the program, with 610,000 hectares allocated for West Sumatra. However, as of March 2022, only 236,904 hectares had been granted [5].

Among the priority areas for social forestry implementation is Nagari Sirukam, Solok Regency, known for its ecological and economic potential. The Long-Term Forest Management Plan of the Protected Forest Management Unit (KPHL) Unit VI emphasizes that social forestry in Solok Regency provides a multitude of ecosystem services, which include supplying freshwater, carbon storage, biodiversity conservation, and the provision of non-timber forest products [6]. These ecosystem services are integral to preserving the ecological balance and supporting local livelihoods, thus demonstrating the significance of strategic forest management and the involvement of local communities in conservation efforts [7].

The Nagari Forest Management Institution Sirukam, under the auspices of the Indonesian Conservation Community (KKI) WARSI, has made significant strides in mitigating illegal logging and advocating for sustainable forest management practices. Recent studies illustrate that local forest management bodies like LPHN are critical in implementing effective conservation strategies and fostering community empowerment initiatives aimed at preserving biodiversity and forest integrity [8]. These strategies integrate community knowledge and practices, ultimately leading to deeper environmental stewardship and more sustainable outcomes for both local ecosystems and communities [9].

Despite its success, several challenges persist in the implementation of social forestry in Sirukam. Preliminary findings highlight human resource capacity as a critical factor, with groups led by younger generations or influential figures demonstrating higher success rates [10]. Moreover, the integration of local wisdom and indigenous knowledge is essential for ensuring sustainable forest practices [11]. To effectively address these challenges, this study explores the application of a co-creation model in social forestry management. Co-creation, originally derived from co-production a concept introduced in industrial cost efficiency strategies has evolved to encompass social and environmental governance [12].

This study aims to develop a co-creation-based social forestry model that enhances community capacity, ensures environmental sustainability, and promotes economic resilience. Specifically, the research seeks to identify success factors and challenges in Nagari Sirukam's social forestry management, analyze the role of indigenous knowledge in supporting long-term forest conservation, and develop a co-creation model tailored for social forestry governance in Indonesia. This research is expected to provide empirical evidence and policy recommendations for enhancing social forestry governance in Indonesia. The co-creation model can serve as a reference for policymakers, environmental organizations, and community groups in developing inclusive and participatory forest management strategies. Additionally, the study aims to contribute to the broader discourse on sustainable development, supporting Indonesia's commitment to the Sustainable Development Goals (SDGs), particularly Goal 15 (Life on Land).

2. Theoretical Review

2.1. Co-Creation

Co-creation is a multifaceted concept that revolves around collaborative activities among various stakeholders aimed at generating value or innovation. Understanding co-creation requires integrating inputs and perspectives from diverse areas, where stakeholder participation plays a critical role. This synthesis will explore the definition of co-creation by examining relevant academic literature and its application across different fields. Fundamentally, co-creation can be defined as "the practice of developing systems, products, or services through collaboration with customers, managers, employees, and other company stakeholders" [13]. This perspective emphasizes that co-creation involves continuous interaction between stakeholders to create value collaboratively, which can lead to innovative outcomes and enhance organizational performance [14]. Furthermore, this collaborative creativity is not restricted to a particular field; instead, it transcends boundaries, as illustrated in healthcare, where co-design is perceived as a specific instance of co-creation focused on the collective creativity applied throughout the design process [15]. In public sector contexts, co-creation has been shown to significantly affect innovation ecosystems, indicating its wide-ranging influence on various sectors [16].

As noted by Spena and Mele, co-creation attributes value not only to the final outputs but also to the process itself, which involves understanding the dynamics of stakeholder interactions through various "Co-s", including co-design and co-production [17]. This reaffirms that co-creation is inherently complex and context-dependent, involving a coordinated effort among individuals across a spectrum of disciplines. Additionally, the participatory nature of co-creation facilitates sustainability through shared goals and partnerships, ensuring all actors benefit from the creation process while addressing diverse needs and aspirations [18, 19].

Moreover, co-creation is increasingly perceived as essential in the context of digital transformation, where businesses leverage technology for enhanced collaboration and innovation [20]. For instance, companies that effectively implement co-creation strategies can significantly bolster their business model innovations through engaged consumer dialogue, empowering users to influence product development [21]. The digital landscape facilitates this engagement, culminating in enhanced customer experiences and closer connections between producers and consumers [22, 23]. In conclusion, co-creation encompasses collaborative innovation and value generation through the synergistic efforts of various stakeholders in multiple contexts. Its applicability ranges from public and healthcare sectors to business and digital ecosystems, highlighting its role in driving innovation and value creation while fostering inclusive partnerships among all participants.

2.2. Sustainable Social Forestry

Sustainable social forestry refers to a forestry management approach that empowers local communities or customary law societies to actively manage forest resources. It emphasizes ecological balance while improving the welfare of these communities through sustainable practices. The underlying principles of sustainable social forestry align with the broader notion of sustainable forest management (SFM), which seeks to harmonize environmental, social, and economic objectives. It is a concept where local communities lead the management of forests, whether state-owned or privately held, to fulfill their economic, social, and cultural needs. It includes various forms such as Village Forests and Community Forests, which are designed to enhance local welfare, maintain environmental balance, and foster socio-cultural dynamics [10]. Furthermore, the framework of sustainable social forestry supports multiple benefits for communities, extending even beyond the areas directly involved in the programs [24].

The retention approach is highlighted by Lindenmayer, et al. [25] as a significant strategy under SFM that aids in maintaining closed-canopy forests and ensures the fulfillment of various ecological functions, essential for promoting the benefits sought in sustainable social forestry [25]. The integration of community rights in forest management is a key tenet, as emphasized by Fakhruddin, et al. [26] who argue that effective governance and secure property rights are vital for the success of community forestry initiatives [26]. In the context of developing countries, sustainable social forestry models have gained traction, reflecting a shift from centralized, state-controlled forestry practices to community-led initiatives, which are seen as fostering social equity and environmental sustainability [27].

2.3. The Adopt-a-Tree Model

The Adopt-a-Tree model represents a significant approach within agroforestry practices aimed at enhancing environmental sustainability and socio-economic resilience in agricultural landscapes. This model promotes community-driven initiatives where local populations engage in the planting, nurturing, and maintenance of trees, which are crucial for combating climate change, enriching biodiversity, and improving soil health.

A critical aspect of the Adopt-a-Tree model is its support for community actions to mitigate environmental degradation through tree planting initiatives. As highlighted by Boukary, et al. [28] local communities have effectively organized collective actions against tree felling, contributing to the sustainability of tree capital within agroforestry systems [28]. This synergy not only enhances food security through improved agricultural productivity but also plays a significant role in carbon sequestration, thus responding to climate challenges [28]. Sustainable agricultural practices, such as those promoted by the Adopt-a-Tree model, yield diverse benefits, including ecological restoration and improved livelihood quality for farmers through increased yield stability and reduced vulnerability to climatic shocks.[29, 30].

Research indicates that the socio-economic characteristics of farmers significantly influence the adoption of such agroforestry initiatives. For instance, factors like resource availability and the accessibility of technical knowledge directly affect the likelihood of adopting the Adopt-a-Tree model [31, 32]. The provision of education on the benefits of tree planting and agroforestry, as noted by Seegers, et al. [33] increases motivation among smallholders to integrate trees within their farming systems [33]. Conversely, barriers such as insufficient access to seedlings and financial constraints pose significant deterrents to the adoption of these environmentally beneficial practices [34, 35].

Through the Adopt-a-Tree model, farmers can achieve multiple sustainability goals. Kinyili et al. [29] illustrate how the model encourages diversification within farming systems, supporting both crop and livestock integration with tree planting, which can significantly enhance rural livelihoods and stabilize household incomes [35]. This holistic approach emphasizes the importance of community-based forestry initiatives in restoring ecological balance and ensuring sustainable resource use [36]. The Adopt-a-Tree model stands as a versatile and impactful strategy for environmental conservation and agricultural enhancement. By fostering local participation, leveraging existing social structures, and emphasizing education and resource accessibility, this model not only facilitates tree growth but also promotes a sustainable livelihood approach in agricultural practices.

3. Methodology

This study employed a mixed-methods approach, integrating quantitative and qualitative methodologies within the framework of Research and Development (R&D) combined with Participatory Action Research (PAR). The R&D approach was utilized to design, validate, and assess the effectiveness of a co-creation-based model of social forestry, referred to as the "Adopt-a-Tree" model. Meanwhile, PAR enabled the active participation of community members and key stakeholders throughout the research process from problem identification and data collection to analysis and intervention. This integrative approach not only facilitated the development of a theoretically sound model but also ensured its contextual relevance and community ownership, particularly in the socio-ecological setting of Nagari Sirukam.

Data were collected using semi-structured interviews, participatory observation, questionnaires, FGDs, and document analysis. Interviews and FGDs captured stakeholder perceptions and experiences in forest governance, while observations revealed real-time community practices. A Likert-scaled questionnaire assessed the model's validity, practicality, and effectiveness. Document analysis enriched findings through institutional records and policy reviews. Participants were purposively selected, including members of the Nagari Forest Management Institution, local authorities, provincial forestry officials, and NGO facilitators. Data were analyzed using a mixed-methods approach. Thematic analysis and triangulation enhanced the credibility of qualitative findings. Quantitative data were examined with descriptive and inferential statistics via SPSS. Instrument validity was confirmed through expert judgment, and reliability was assessed with Cronbach's Alpha. Model effectiveness was tested using a pre-test–post-test control group design with gain scores. Percentage analysis and Guttman scales assessed documentation completeness and consistency. This comprehensive method ensured strong evidence of the co-creation forestry model's usability and societal impact.

4. Results and Discussion

This section outlines the five development stages employed in this study, namely: (1) Analysis, (2) Design, (3) Development, (4) Implementation, and (5) Evaluation.

4.1. Analysis

The analysis phase involved a preliminary study to identify the needs and context of Nagari Sirukam, Solok Regency, through documentation, observation, and interviews. The findings indicate that Nagari Sirukam, a remote rural area with 5,654 residents, faces low education levels, high unemployment, limited access to information, and weak stakeholder involvement in forest management. The local Forest Management Institution (LPHN Sirukam), established in 2013, plays a key role in forest conservation, non-timber product utilization, and institutional development.

Identifying problems and potentials is a crucial foundation in development initiatives. Based on preliminary data gathered through document analysis, observation, and interviews, key challenges in social forestry management by LPHN Sirukam include low economic conditions (42% unemployment, 32% poverty), limited environmental awareness, poor access to information due to geographic isolation, and low stakeholder participation. Despite these issues, Nagari Sirukam has strong potential, with 77% forest cover, fertile land, and the Batang Lawas River supporting agriculture, which sustains 90% of the population through rice, horticulture, and plantation crops such as cocoa, rubber, cloves, and coffee.

The needs analysis, based on interviews with key stakeholders, identified essential inputs for developing a community-based forest management model in Nagari Sirukam. Social forestry was introduced to address illegal logging and improve livelihoods through sustainable forest use. The program involves collaboration among local government, KPHL, LPHN, NGOs, and community members, focusing on activities such as forest patrols, tree planting, and the development of non-timber forest products (NTFPs). Key challenges include limited funding, infrastructure gaps, low institutional capacity, and weak coordination. However, strong community participation and abundant forest resources offer opportunities for NTFP development and ecotourism. Strengthening institutional capacity, securing sustainable funding, and improving market access are critical to the long-term program's success.

4.2. Design

A Focus Group Discussion (FGD) was conducted on October 16, 2024, at the Bapenlitbang Office of Solok Regency, involving relevant stakeholders to explore the needs and provide input for the development of a sustainable social forestry model based on the co-creation of the Pohon Asuh (Adopt-a-Tree) initiative in Nagari Sirukam. The discussion identified several key points regarding needs and challenges: (1) Participants noted the limited human resources and lack of technical capacity in sustainable forest management, emphasizing the need for targeted training programs; (2) Inadequate supporting infrastructure, including poor road access and insufficient storage facilities for forest products, was highlighted as a major barrier; (3) Conflicts of interest between indigenous communities, government institutions, and private stakeholders were identified as challenges in forest utilization; (4) The lack of funding for social forestry programs was seen as a significant obstacle to implementing a long-term, sustainable model; (5) The discussion emphasized the importance of increasing public education and awareness regarding social forestry and the Pohon Asuh co-creation concept to foster broader community participation and program sustainability.

The FGD produced key inputs for designing a sustainable social forestry model based on the Pohon Asuh (Adopt-a-Tree) co-creation approach in Nagari Sirukam. The model should incorporate community training, infrastructure development, conflict resolution mechanisms, sustainable funding schemes, and continuous public education. Active participation and a participatory monitoring system are essential to ensure long-term impact. Drawing from a comparative analysis of existing co-creation models, this model offers a novel, inclusive, and context-sensitive framework that addresses social, economic, and ecological dimensions. The outputs include a model handbook detailing its rationale, components, and implementation, and a pocketbook providing practical guidance for LPHN Sirukam on managing the Pohon Asuh program. These tools aim to strengthen local capacity, encourage collaborative forest governance, and support the realization of integrated, sustainable social forestry.

4.3. Development

This study sheds light on the significant role of destination authenticity in fostering tourist loyalty, with findings indicating that every enhancement in authenticity contributes to a measurable increase in loyalty among visitors to West Sumatra. By preserving cultural heritage, local traditions, distinctive architecture, and inherited values, destinations create

authentic experiences that go beyond passive sightseeing. These experiences form emotional connections and lasting impressions, encouraging tourists to revisit, recommend, and maintain loyalty toward destinations that honor their unique identities.

A key challenge in social forestry research is the limited integration of ecological, social, and economic dimensions, with existing studies often focusing on business or public sectors while neglecting the complex dynamics specific to community-based forestry. Current co-creation models rarely incorporate local wisdom or indigenous cultural values, and most lack mechanisms for long-term sustainability. This study addresses these gaps by developing the Pohon Asuh co-creation model, rooted in the local context of Nagari Sirukam, which balances ecological conservation, social empowerment, and economic development. The model integrates participatory planning, local knowledge, and sustainable practices, and was designed by analyzing gaps in existing frameworks and developing core components such as syntax, social systems, reaction principles, support mechanisms, and long-term impact.

The syntax of the Pohon Asuh-based social forestry co-creation model developed in this study presents an innovative approach to integrating environmental conservation with community empowerment. Grounded in the principles of collaboration and adaptability, the model contributes to the sustainable natural resource management literature while offering practical guidance for similar contexts. The study aims to formulate a sustainable social forestry development model that fosters multi-stakeholder collaboration and integrates ecological, economic, and socio-cultural dimensions. Using the case of Nagari Sirukam, the model was developed through four systematic stages: initial identification and diagnosis, stakeholder coordination and collaboration, implementation of the Pohon Asuh program, and participatory monitoring and evaluation.

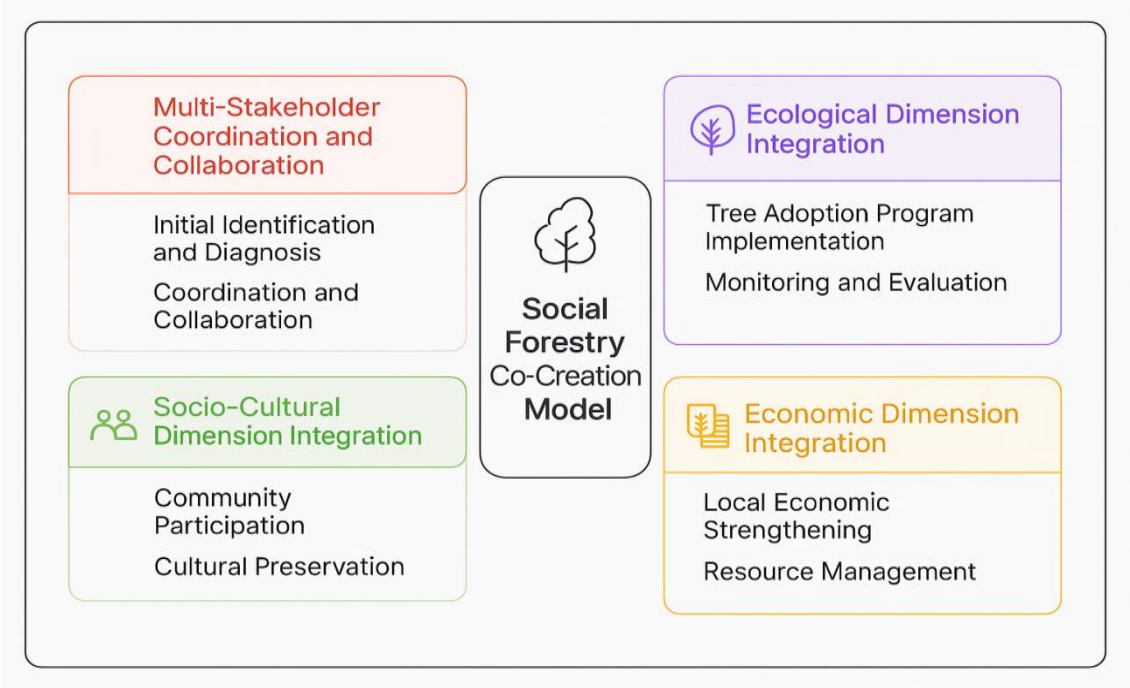

Figure 1.
Syntax Model.

Prior to conducting model validation, instrument validation was carried out by three expert validators relevant to the research topic. The validation process encompassed the instrument, the model book, and the pocket book. The experts represented competencies in environmental science, social forestry practices, and linguistics.

Table 1.
Recapitulation of Validation Results.

Validation Test	Mean Score	Category	Description
Instrument	81.78	Predicate	Highly Valid
Model Book	82.44	Predicate	Highly Valid
Pocket Book	82.00	Predicate	Highly Valid

Table 1 presents a summary of the validation results for the developed materials. The instrument obtained an average score of 81.78, the model book achieved 82.44, and the pocket book received 82.00. Based on these scores, all components were categorized as highly valid, indicating strong agreement among validators regarding their relevance and quality for educational use.

Table 2.
Reliability Statistics.

Reliability Test	Cronbach Alpha	Description
Instrument	0.852	Reliability
Model Book	0.692	Reliability
Pocket Book	0.768	Reliability

The reliability test was conducted using Cronbach's Alpha coefficient to determine the internal consistency of each developed component. As shown in the table, the instrument achieved a Cronbach's Alpha of 0.852, indicating a high level of reliability. The model book and pocket book obtained coefficients of 0.692 and 0.768, respectively. According to standard psychometric criteria, all three components demonstrated acceptable reliability ($\alpha > 0.60$), with the instrument categorized as highly reliable and the two books meeting the threshold for reliable educational tools. These findings confirm the internal consistency and dependability of the developed materials for further implementation in the field.

5. Implementation

5.1. Mechanism for Managing Sponsorship-Based Tree Service Funds

The Adopt-a-Tree program in Nagari Sirukam is a collaborative social forestry initiative involving local communities (LPHN), government agencies, NGOs, private donors, and businesses. It allows individuals or organizations to donate annually for the care of selected trees, aiming to conserve forests and support local livelihoods. Managed by "Satgas Parimbo," the program has identified 531 trees, with 214 already adopted, some by public figures. Despite its success in reducing illegal logging, local participation remains low. Funds raised, including from events like "Kulari ke Hutan," are allocated 80% for forest activities and 20% for community welfare programs. The Adopt-a-Tree fund in Nagari Sirukam is allocated 80% to support forest conservation activities such as tree tagging, signage, patrols, access maintenance, education, and institutional operations, while 20% is dedicated to community welfare, including mosque construction and scholarships for outstanding students. This mechanism ensures a balance between ecological preservation and local development.

Table 3.
Fund Management Mechanism for the Adopt-a-Tree Program.

Adopt-a-Tree Fund Allocation	Details
80% (Forest and Program Activities)	1. Tree tagging and installation of identification plates. 2. Construction of information posts and signage related to the adopt-a-tree program and the Nagari forest 3. Trail maintenance and access cleaning at tree adoption sites 4. Area patrols and forest security 5. Environmental education and promotional activities 6. Institutional operational funds
20% (Community Welfare Activities)	1. Construction of mosques and prayer rooms (*mushalla*) 2. Scholarships for high-achieving students

Social Forestry Business Group. The implementation of the Pohon Asuh (Adopt-a-Tree) program in Nagari Sirukam has not only supported forest conservation but also stimulated the development of forest-based enterprises through the establishment of Social Forestry Business Groups (KUPS). These include Ecotourism KUPS, Coffee KUPS, Honeybee KUPS, and Compost KUPS. Ecotourism KUPS promotes nature tourism around the Pohon Asuh areas by developing attractions such as ATV trails, camping grounds, and glamping facilities, targeting nature enthusiasts. Sirukam Dairy Farm Nature Park, managed by LPHN, further supports conservation, ecotourism, education, and cultural preservation. Coffee KUPS processes Arabica and Robusta beans sourced from both forest areas and local farmers, including heritage varieties known as Kopi Londo. Honeybee KUPS manages 70 hives of Hitama and Torashika bees, producing unique, mildly sweet klulut honey. Compost KUPS processes organic waste and animal manure into compost and organic fertilizer, promoting sustainable waste management.

The practicality test of the pohon asuh co-creation model in Nagari Sirukam yielded positive results, with an average score of 81.20, indicating high usability. Respondents rated the model highly on user experience (4.00), clarity of guidance (3.97), and effectiveness in addressing forest management issues (3.93). The model also enhanced awareness (3.90) and aligned well with local needs (3.73). While overall responses confirmed its practicality and relevance, slightly lower scores on co-creation (3.47) and practical solutions (3.57) highlight areas for refinement.

5.2. Evaluation

The effectiveness of the co-creation-based sustainable social forestry model was evaluated through a pretest-posttest design using paired sample t-tests and one-way t-tests. Effectiveness was determined by the significant differences between pretest and posttest scores, supported by gain score analysis to measure participants' knowledge improvement. The gain score, calculated as the difference between posttest and pretest results, confirmed a positive impact of the model intervention on participants' understanding and engagement in social forestry practices.

Table 4.
Descriptive Statistics.

	N	Minimum	Maximum	Mean	Std. Deviation
Pre-test	30	28.00	84.00	50.6000	13.06018
Post-test	30	44.00	96.00	71.6000	15.62185
Valid N	30				

The statistical analysis of the pretest and posttest scores for 30 participants reveals a substantial improvement in knowledge following the implementation of the pohon asuh co-creation model. The mean pretest score was 50.60 (SD = 13.06), while the mean posttest score increased to 71.60 (SD = 15.62), indicating a mean gain of 21.00 points. The minimum and maximum scores also increased from 28.00–84.00 in the pretest to 44.00–96.00 in the posttest, demonstrating a consistent upward shift in performance. These results suggest that the model significantly enhanced participants' understanding of sustainable social forestry. The increased posttest mean, alongside a broader score distribution, supports the model's effectiveness as an educational and participatory tool for community-based forest management.

5.3. Co-creation Enhances Knowledge and Participation in Sustainable Social Forestry: Evidence from the Adopt-a-Tree Model in Nagari Siruka

This study underscores the importance of a multi-stakeholder co-creation model in addressing key challenges and optimizing the potential of social forestry in Nagari Sirukam. Major issues identified include socio-economic vulnerability, weak institutional capacity, and limited access to resources and technology. Despite these, the region holds strong assets such as vast forest areas, diverse forest products, and active community support. Preliminary findings also revealed barriers like high poverty and unemployment, low environmental awareness, limited information access, and weak community engagement. These highlight the need to strengthen governance, improve institutional capacity, and ensure inclusive participation, particularly from women and youth.

The pohon asuh model demonstrated strong validity (82.44% for the model book; 82% for the pocket guide) and effectiveness, with post-test scores significantly higher than pre-test (71.6 vs. 50.6), and a moderate gain score of 0.44. These results show the model's positive impact on participants' knowledge and skills. Although some gaps remain, such as limited incentives for forest patrols, lack of monitoring tools, and poor market access, the model promotes transparency, inclusivity, and sustainable forest governance. Through NTFP-based enterprises and ecotourism, it offers income opportunities while preserving the environment. Further refinement and stakeholder commitment are essential to maximize its impact and scalability.

This study proposes the development of a sustainable social forestry model based on the Pohon Asuh co-creation approach, offering four key contributions: (1) the integration of co-creation principles with local wisdom in Nagari Sirukam, aligning traditional ecological knowledge and communal practices with participatory innovation; (2) the formulation of a new adaptive model syntax comprising five stages: initial diagnosis, multi-stakeholder coordination, program implementation, monitoring, and evaluation; (3) the establishment of a comprehensive framework supporting ecological, economic, and social sustainability through biodiversity preservation, forest-based enterprise development, and community empowerment; and (4) the promotion of a participatory governance model that positions indigenous communities as central actors in decision-making. This approach not only strengthens cultural identity and community ownership but also fosters inclusive and context-specific solutions. By embedding co-creation within local forest governance, the model enhances both sustainability and equity, offering a replicable innovation for similar socio-ecological landscapes.

6. Conclusion

The sustainable social forestry development model through the co-creation of 'Adopt-a-Tree' products in Nagari Sirukam, Solok Regency, can be concluded that the social forestry approach provides a framework for natural resource management that ensures the legality of land use while promoting forest conservation and enhancing the local economy. Additionally, the implementation of the social forestry program in Nagari Sirukam, Payung Sekaki District, Solok Regency, has yielded significant economic benefits for the local community. The 'Adopt-a-Tree' initiative managed by the LPHN Sirukam has contributed to the growth of local economic enterprises, including Londo coffee cultivation, stingless bee honey production, ecotourism development, and the management of tree adoption donations. The social forestry development model, based on the co-creation of the 'Adopt-a-Tree' program, addresses the needs and expectations of Nagari Sirukam forest managers, particularly regarding forest asset protection. Operational costs for patrols and forest security require financial support, and the co-creation initiative offers an innovative solution by generating compensation for forest protection efforts. Further development and scaling of this model will contribute to broader adoption and sustainable forest management across Indonesia.

7. Recommendation

The results of the study indicate that the co-creation-based *Pohon Asuh* model for sustainable social forestry development is valid, practical, and effective, making it suitable for application in social forestry management settings by institutions such as the *Lembaga Pengelola Hutan Nagari* (LPHN). However, this study has certain limitations. First, the implementation of the model is limited to social forestry management conducted by similar institutions, such as the LPHN in Nagari Sirukam. Second, the model's effectiveness has not yet covered assessments of the reflection aspect, and thus, a clear evaluation format for individual reflection sheets has not been established.

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